

Claims 1-5 previously canceled.

Claim 6. (previously amended) An isolated polynucleotide comprising a nucleotide sequence encoding a N-acetylglutamate kinase, wherein the polypeptide has the amino acid sequence set forth in SEQ ID NO:12.

Claim 7. (previously canceled)

Claim 8. (previously amended) The polynucleotide of Claim 6 wherein:

Xaa at position 2 is Leu,
Xaa at position 3 is Leu,
Xaa at position 4 is Thr,
Xaa at position 5 is Lys,
Xaa at position 6 is Pro,
Xaa at position 7 is Tyr,
Xaa at position 8 is Leu,
Xaa at position 9 is Ser,
Xaa at position 10 is Asn,
Xaa at position 11 is Ser,
Xaa at position 12 is Leu,
Xaa at position 13 is Leu,
Xaa at position 14 is Pro,
Xaa at position 15 is Val,
Xaa at position 16 is Pro,
Xaa at position 17 is Ser,
Xaa at position 18 is Pro,
Xaa at position 19 is Pro,
Xaa at position 20 is Pro,
Xaa at position 21 is Ser,
Xaa at position 22 is Gly,
Xaa at position 24 is Thr,
Xaa at position 25 is Leu,
Xaa at position 26 is Ser,
Xaa at position 27 is Ser,
Xaa at position 28 is Asn,
Xaa at position 29 is His,
Xaa at position 30 is Ala,
Xaa at position 31 is Ser,
Xaa at position 32 is Pro,
Xaa at position 33 is Leu,
Xaa at position 34 is Ala,

Xaa at position 35 is Ala,
Xaa at position 36 is Pro,
Xaa at position 37 is Thr,
Xaa at position 38 is Cys,
Xaa at position 39 is Arg,
Xaa at position 40 is none,
Xaa at position 41 is Arg,
Xaa at position 42 is Ser,
Xaa at position 43 is Arg,
Xaa at position 44 is Leu,
Xaa at position 45 is Arg,
Xaa at position 46 is Ile,
Xaa at position 47 is Ser,
Xaa at position 48 is Ala,
Xaa at position 49 is Thr,
Xaa at position 50 is Ser,
Xaa at position 51 is Thr,
Xaa at position 52 is Ala,
Xaa at position 53 is Ala,
Xaa at position 54 is Pro,
Xaa at position 55 is Ser,
Xaa at position 56 is Pro,
Xaa at position 57 is Ser
Xaa at position 58 is Ser,
Xaa at position 60 is Ala,
Xaa at position 61 is Ala,
Xaa at position 63 is Thr,
Xaa at position 64 is Ala,
Xaa at position 65 is Ser,
Xaa at position 66 is Leu,
Xaa at position 67 is Ser,
Xaa at position 75 is Ala,
Xaa at position 81 is Arg,
Xaa at position 83 is Lys,
Xaa at position 87 is Val,
Xaa at position 107 is Arg,
Xaa at position 118 is Arg,
Xaa at position 134 is Leu,

Xaa at position 136 is Val,
Xaa at position 137 is Gly,
Xaa at position 138 is Val,
Xaa at position 139 is Glu,
Xaa at position 140 is Pro,
Xaa at position 141 is Gln,
Xaa at position 144 is Asp,
Xaa at position 150 is Asp,
Xaa at position 151 is Ala,
Xaa at position 152 is Leu,
Xaa at position 153 is Thr,
Xaa at position 154 is Met,
Xaa at position 155 is Glu,
Xaa at position 156 is Val,
Xaa at position 157 is Val,
Xaa at position 158 is Glu,
Xaa at position 159 is Met,
Xaa at position 160 is Val,
Xaa at position 161 is Leu,
Xaa at position 162 is Val,
Xaa at position 163 is Gly,
Xaa at position 164 is Lys,
Xaa at position 165 is Val,
Xaa at position 166 is Asn,
Xaa at position 168 is Asn,
Xaa at position 170 is Val,
Xaa at position 174 is Asn,
Xaa at position 175 is Ile,
Xaa at position 176 is Ala,
Xaa at position 178 is Gly,
Xaa at position 179 is Thr,
Xaa at position 181 is Ile,
Xaa at position 182 is Gly,
Xaa at position 184 is Cys,
Xaa at position 185 is Gly,
Xaa at position 186 is Lys,
Xaa at position 187 is Asp,
Xaa at position 188 is Ala,

Xaa at position 190 is Leu,
Xaa at position 191 is Ile,
Xaa at position 192 is Thr,
Xaa at position 193 is Ala,
Xaa at position 196 is Ser,
Xaa at position 198 is Asn,
Xaa at position 199 is Ala,
Xaa at position 200 is Ala,
Xaa at position 201 is Ala,
Xaa at position 203 is Gly,
Xaa at position 204 is Phe,
Xaa at position 207 is Glu,
Xaa at position 209 is Ser,
Xaa at position 211 is Val,
Xaa at position 212 is Asp,
Xaa at position 213 is Ala,
Xaa at position 214 is Thr,
Xaa at position 217 is His,
Xaa at position 218 is Pro,
Xaa at position 219 is Ile,
Xaa at position 221 is Ala,
Xaa at position 222 is Ala,
Xaa at position 223 is Gly,
Xaa at position 228 is Ile,
Xaa at position 229 is Ala,
Xaa at position 230 is Thr,
Xaa at position 232 is Ala,
Xaa at position 236 is Thr,
Xaa at position 239 is Ala,
Xaa at position 247 is Ala,
Xaa at position 251 is Ile,
Xaa at position 254 is Ala,
Xaa at position 255 is Val,
Xaa at position 261 is Leu,
Xaa at position 263 is Leu,
Xaa at position 267 is Ser,
Xaa at position 271 is Ala,
Xaa at position 274 is Asn,

Xaa at position 277 is Gly,
Xaa at position 282 is Val,
Xaa at position 283 is Val,
Xaa at position 286 is Ala,
Xaa at position 290 is Lys,
Xaa at position 292 is Val,
Xaa at position 293 is Ala,
Xaa at position 294 is Asp,
Xaa at position 296 is Lys,
Xaa at position 298 is Ala,
Xaa at position 306 is Glu,
Xaa at position 310 is His,
Xaa at position 311 is Ala,
Xaa at position 317 is His, and
Xaa at position 340 is Thr.

Claim 9. (previously amended) The polynucleotide of Claim 6 wherein:

Xaa at position 2 is Leu,
Xaa at position 3 is Leu,
Xaa at position 4 is Ala,
Xaa at position 5 is Lys,
Xaa at position 6 is Pro,
Xaa at position 7 is His,
Xaa at position 8 is Leu,
Xaa at position 9 is Ser,
Xaa at position 10 is Ser,
Xaa at position 11 is Ser,
Xaa at position 12 is Ser,
Xaa at position 13 Phe,
Xaa at position 14 is none,
Xaa at position 15 is Leu,
Xaa at position 16 is Pro,
Xaa at position 17 is Ser,
Xaa at position 18 is Thr,
Xaa at position 19 is Arg,
Xaa at position 20 is Val,
Xaa at position 21 is Ser,
Xaa at position 22 is Ser,

Xaa at position 24 is Ala,
Xaa at position 25 is Pro,
Xaa at position 26 is Gly,
Xaa at position 27 is Pro,
Xaa at position 28 is Asn,
Xaa at position 29 is His,
Xaa at position 30 is Ala,
Xaa at position 31 is Lys,
Xaa at position 32 is Pro,
Xaa at position 33 is Ile,
Xaa at position 34 is Ala,
Xaa at position 35 is Ala,
Xaa at position 36 is Ser,
Xaa at position 37 is Pro,
Xaa at position 38 is Ala,
Xaa at position 39 is Pro,
Xaa at position 40 is none,
Xaa at position 41 is Arg,
Xaa at position 42 is Arg,
Xaa at position 43 is Cys,
Xaa at position 44 is Leu,
Xaa at position 45 is Arg,
Xaa at position 46 is Leu,
Xaa at position 47 is Ala,
Xaa at position 48 is Val,
Xaa at position 49 is Thr,
Xaa at position 50 is Ser,
Xaa at position 51 is Ala,
Xaa at position 52 is Ala,
Xaa at position 53 is Ala,
Xaa at position 54 is Pro,
Xaa at position 55 is Ala,
Xaa at position 56 is Ala,
Xaa at position 57 is Ser,
Xaa at position 58 is Ser,
Xaa at position 60 is Glu,
Xaa at position 61 is Ala,
Xaa at position 63 is none,

Xaa at position 64 is Ala,
Xaa at position 65 is Ala,
Xaa at position 66 is Leu,
Xaa at position 67 is Ser,
Xaa at position 75 is Ala,
Xaa at position 81 is Arg,
Xaa at position 83 is Lys,
Xaa at position 87 is Val,
Xaa at position 107 is Arg,
Xaa at position 118 is His,
Xaa at position 134 is Leu,
Xaa at position 136 is Val,
Xaa at position 137 is Gly,
Xaa at position 138 is Val,
Xaa at position 139 is Glu,
Xaa at position 140 is Pro,
Xaa at position 141 is Gln,
Xaa at position 144 is Asn,
Xaa at position 150 is Asp,
Xaa at position 151 is Ala,
Xaa at position 152 is Leu,
Xaa at position 153 is Asn,
Xaa at position 154 is Met,
Xaa at position 155 is Glu,
Xaa at position 156 is Val,
Xaa at position 157 is Val,
Xaa at position 158 is Glu,
Xaa at position 159 is Met,
Xaa at position 160 is Val,
Xaa at position 161 is Leu,
Xaa at position 162 is Val,
Xaa at position 163 is Arg,
Xaa at position 164 is Lys,
Xaa at position 165 is Val,
Xaa at position 166 is Asn,
Xaa at position 168 is Glu,
Xaa at position 170 is Leu,
Xaa at position 174 is Lys,

Xaa at position 175 is Leu,
Xaa at position 176 is Pro,
Xaa at position 178 is Gly,
Xaa at position 179 is Ser,
Xaa at position 181 is Val,
Xaa at position 182 is Ser,
Xaa at position 184 is Cys,
Xaa at position 185 is Trp,
Xaa at position 186 is Lys,
Xaa at position 187 is Glu,
Xaa at position 188 is Ala,
Xaa at position 190 is Leu,
Xaa at position 191 is Leu,
Xaa at position 192 is Asn,
Xaa at position 193 is Glu,
Xaa at position 196 is Ser,
Xaa at position 198 is any amino acid,
Xaa at position 199 is Glu,
Xaa at position 200 is Lys,
Xaa at position 201 is Gly,
Xaa at position 203 is Arg,
Xaa at position 204 is Phe,
Xaa at position 207 is Gly,
Xaa at position 209 is Trp,
Xaa at position 211 is Val,
Xaa at position 212 is Asp,
Xaa at position 213 is Ala,
Xaa at position 214 is Thr,
Xaa at position 217 is His,
Xaa at position 218 is Pro,
Xaa at position 219 is Ile,
Xaa at position 221 is Ala,
Xaa at position 222 is Ser,
Xaa at position 223 is Gly,
Xaa at position 228 is Ile,
Xaa at position 229 is Ala,
Xaa at position 230 is Thr,
Xaa at position 232 is Gly,

Xaa at position 236 is Thr
Xaa at position 239 is Ala,
Xaa at position 247 is Ala,
Xaa at position 251 is Ile,
Xaa at position 254 is Ala,
Xaa at position 255 is Val,
Xaa at position 261 is Leu,
Xaa at position 263 is Leu,
Xaa at position 267 is Ser,
Xaa at position 271 is Ala,
Xaa at position 274 is Asn,
Xaa at position 277 is Gly,
Xaa at position 282 is Glu,
Xaa at position 283 is Ile,
Xaa at position 286 is Ala,
Xaa at position 290 is Gln,
Xaa at position 292 is Val,
Xaa at position 293 is Ala,
Xaa at position 294 is Asp,
Xaa at position 296 is Gln,
Xaa at position 298 is Ala,
Xaa at position 306 is Glu,
Xaa at position 310 is Arg,
Xaa at position 311 is Ala,
Xaa at position 317 is His; and
Xaa at position 340 is Thr.

Claim 10. (previously amended) The polynucleotide of Claim 6 wherein:

Xaa at position 2 is Met,
Xaa at position 3 is Ala,
Xaa at position 4 is Gly,
Xaa at position 5 is none,
Xaa at position 6 is none,
Xaa at position 7 is none,
Xaa at position 8 is none,
Xaa at position 9 is Ala,
Xaa at position 10 is Ala,
Xaa at position 11 is Lys,

Xaa at position 12 is Thr,
Xaa at position 13 is Leu,
Xaa at position 14 is Thr,
Xaa at position 15 is Asn,
Xaa at position 16 is Leu,
Xaa at position 17 is Cys,
Xaa at position 18 is Pro,
Xaa at position 19 is Ser,
Xaa at position 20 is Phe,
Xaa at position 21 is Pro,
Xaa at position 22 is Phe,
Xaa at position 24 is Thr,
Xaa at position 25 is Lys,
Xaa at position 26 is Pro,
Xaa at position 27 is Gln,
Xaa at position 28 is Asn,
Xaa at position 29 is Gln,
Xaa at position 30 is Leu,
Xaa at position 31 is Thr,
Xaa at position 32 is Thr,
Xaa at position 33 is Ser,
Xaa at position 34 is His,
Xaa at position 35 is Ala,
Xaa at position 36 is Phe,
Xaa at position 37 is Pro,
Xaa at position 38 is Ser,
Xaa at position 39 is Thr,
Xaa at position 40 is Arg,
Xaa at position 41 is Leu,
Xaa at position 42 is Arg,
Xaa at position 43 is His,
Xaa at position 44 is Arg,
Xaa at position 45 is Ala,
Xaa at position 46 is Ile,
Xaa at position 47 is Ser,
Xaa at position 48 is Ala,
Xaa at position 49 is Val,
Xaa at position 50 is Ala,

Xaa at position 51 is Asn,
Xaa at position 52 is Ala,
Xaa at position 53 is Ala,
Xaa at position 54 is Gln,
Xaa at position 55 is Pro,
Xaa at position 56 is Pro,
Xaa at position 57 is Leu,
Xaa at position 58 is Ala,
Xaa at position 60 is Ala,
Xaa at position 61 is Thr,
Xaa at position 63 is Thr,
Xaa at position 64 is Glu,
Xaa at position 65 is Gly,
Xaa at position 66 is Gln,
Xaa at position 67 is Tyr,
Xaa at position 75 is Ser,
Xaa at position 81 is Lys,
Xaa at position 83 is Arg,
Xaa at position 87 is Ile,
Xaa at position 107 is Asn,
Xaa at position 118 is Arg,
Xaa at position 134 is Gly,
Xaa at position 136 is Leu,
Xaa at position 137 is Asn,
Xaa at position 138 is Ile,
Xaa at position 139 is Pro,
Xaa at position 140 is Ala,
Xaa at position 141 is Val,
Xaa at position 144 is Asp,
Xaa at position 150 is Asp,
Xaa at position 151 is Ala,
Xaa at position 152 is Asp,
Xaa at position 153 is Thr,
Xaa at position 154 is Met,
Xaa at position 155 is Glu,
Xaa at position 156 is Ile,
Xaa at position 157 is Val,
Xaa at position 158 is Ser,

Xaa at position 159 is Met,
Xaa at position 160 is Val,
Xaa at position 161 is Leu,
Xaa at position 162 is Val,
Xaa at position 163 is Gly,
Xaa at position 164 is Lys,
Xaa at position 165 is Val,
Xaa at position 166 is Asn,
Xaa at position 168 is Thr,
Xaa at position 170 is Val,
Xaa at position 174 is Asn,
Xaa at position 175 is Lys,
Xaa at position 176 is Ala,
Xaa at position 178 is Ala,
Xaa at position 179 is Thr,
Xaa at position 181 is Val,
Xaa at position 182 is Gly,
Xaa at position 184 is Ser,
Xaa at position 185 is Gly,
Xaa at position 186 is Met,
Xaa at position 187 is Asp,
Xaa at position 188 is Gly,
Xaa at position 190 is Leu,
Xaa at position 191 is Leu,
Xaa at position 192 is Thr,
Xaa at position 193 is Ala,
Xaa at position 196 is Ala,
Xaa at position 198 is Lys,
Xaa at position 199 is Ala,
Xaa at position 200 is Ala,
Xaa at position 201 is Asp,
Xaa at position 203 is Gly,
Xaa at position 204 is Tyr,
Xaa at position 207 is Glu,
Xaa at position 209 is Ala,
Xaa at position 211 is Val,
Xaa at position 212 is Asp,
Xaa at position 213 is Pro,

Xaa at position 214 is Ala,
Xaa at position 217 is Arg,
Xaa at position 218 is Ser,
Xaa at position 219 is Leu,
Xaa at position 221 is Asp,
Xaa at position 222 is Thr,
Xaa at position 223 is Ser,
Xaa at position 228 is Val,
Xaa at position 229 is Thr,
Xaa at position 230 is Ser,
Xaa at position 232 is Ala,
Xaa at position 236 is Ser,
Xaa at position 239 is Pro,
Xaa at position 247 is Val,
Xaa at position 251 is Leu,
Xaa at position 254 is Ser,
Xaa at position 255 is Leu,
Xaa at position 261 is Ile,
Xaa at position 263 is Leu,
Xaa at position 267 is Ala,
Xaa at position 271 is Glu,
Xaa at position 274 is Asn,
Xaa at position 277 is Asp,
Xaa at position 282 is Lys,
Xaa at position 283 is Ile,
Xaa at position 286 is Lys,
Xaa at position 290 is Lys,
Xaa at position 292 is Met,
Xaa at position 293 is Glu,
Xaa at position 294 is Asp,
Xaa at position 296 is Lys,
Xaa at position 298 is Gly,
Xaa at position 306 is Asn,
Xaa at position 310 is Arg,
Xaa at position 311 is Ser,
Xaa at position 317 is Ile, and
Xaa at position 340 is Ala.

Claim 11. (previously amended) The polynucleotide of Claim 6 wherein:

Xaa at position 2 is Leu,
Xaa at position 3 is Leu,
Xaa at position 4 is Thr,
Xaa at position 5 is Lys,
Xaa at position 6 is Pro,
Xaa at position 7 is His,
Xaa at position 8 is none,
Xaa at position 9 is none,
Xaa at position 10 is none,
Xaa at position 11 is Pro,
Xaa at position 12 is Ala,
Xaa at position 13 is Leu,
Xaa at position 14 is Thr,
Xaa at position 15 is Leu,
Xaa at position 16 is Pro,
Xaa at position 17 is Ser,
Xaa at position 18 is Ala,
Xaa at position 19 is Ser,
Xaa at position 20 is Leu,
Xaa at position 21 is Pro,
Xaa at position 22 is Asn,
Xaa at position 24 is Asn,
Xaa at position 25 is Leu,
Xaa at position 26 is Lys,
Xaa at position 27 is Ala,
Xaa at position 28 is Ala,
Xaa at position 29 is Arg,
Xaa at position 30 is Val,
Xaa at position 31 is Arg,
Xaa at position 32 is Pro,
Xaa at position 33 is Leu,
Xaa at position 34 is Ala,
Xaa at position 35 is Ser,
Xaa at position 36 is Ser,
Xaa at position 37 is Ala,
Xaa at position 38 is Pro,
Xaa at position 39 is His,

Xaa at position 40 is Gly,
Xaa at position 41 is Arg,
Xaa at position 42 is Arg,
Xaa at position 43 is Gly,
Xaa at position 44 is Leu,
Xaa at position 45 is Arg,
Xaa at position 46 is Val,
Xaa at position 47 is none,
Xaa at position 48 is none,
Xaa at position 49 is none,
Xaa at position 50 is Ser,
Xaa at position 51 is Ala,
Xaa at position 52 is Ser,
Xaa at position 53 is Ser,
Xaa at position 54 is Ser,
Xaa at position 55 is Ser,
Xaa at position 56 is Leu,
Xaa at position 57 is Ala,
Xaa at position 58 is Pro,
Xaa at position 60 is Gln,
Xaa at position 61 is Ala,
Xaa at position 63 is Ser,
Xaa at position 64 is Ala,
Xaa at position 65 is Ala,
Xaa at position 66 is Leu,
Xaa at position 67 is Asn,
Xaa at position 75 is Ala,
Xaa at position 81 is Lys,
Xaa at position 83 is Arg,
Xaa at position 87 is Val,
Xaa at position 107 is Arg,
Xaa at position 118 is Arg,
Xaa at position 134 is Gln,
Xaa at position 136 is Val,
Xaa at position 137 is Gly,
Xaa at position 138 is Val,
Xaa at position 139 is any amino acid,
Xaa at position 140 is Pro,

Xaa at position 141 is Gln,
Xaa at position 144 is Asn,
Xaa at position 150 through 166 is any amino acid
Xaa at position 168 is Gln,
Xaa at position 170 is Leu,
Xaa at position 174 is Arg,
Xaa at position 175 is Pro,
Xaa at position 176 is Ala,
Xaa at position 178 is Thr,
Xaa at position 179 is Thr,
Xaa at position 181 is Val,
Xaa at position 182 is Gly,
Xaa at position 184[[-]] is Cys,
Xaa at position 185 is Arg,
Xaa at position 186 is Lys,
Xaa at position 187 is Asp,
Xaa at position 188 is Gly,
Xaa at position 190 is Ile,
Xaa at position 191 is Leu,
Xaa at position 192 is Thr,
Xaa at position 193 is Glu,
Xaa at position 196 is Ser,
Xaa at position 198 is Asp,
Xaa at position 199 is Ala,
Xaa at position 200 is Ala,
Xaa at position 201 is Ala,
Xaa at position 203 is Gly,
Xaa at position 204 is Phe,
Xaa at position 207 is Glu,
Xaa at position 209 is Thr,
Xaa at position 211 is Lys,
Xaa at position 212 is Asn,
Xaa at position 213 is Pro,
Xaa at position 214 is Ser,
Xaa at position 217 is His,
Xaa at position 218 is Pro,
Xaa at position 219 is Ile,
Xaa at position 221 is Ala,

Xaa at position 222 is Ser,
Xaa at position 223 is Ser,
Xaa at position 228 is Ile,
Xaa at position 229 is Ala,
Xaa at position 230 is Thr,
Xaa at position 232 is Ala,
Xaa at position 236 is Thr,
Xaa at position 239 is Ala,
Xaa at position 247 is Ala,
Xaa at position 251 is Ile,
Xaa at position 254 is Ala,
Xaa at position 255 is Ile,
Xaa at position 261 is Leu,
Xaa at position 263 is Ile,
Xaa at position 267 is Ser,
Xaa at position 271 is Ala,
Xaa at position 274 is Asp,
Xaa at position 277 is Gly,
Xaa at position 282 is Glu,
Xaa at position 283 is Ile,
Xaa at position 286 is Ala,
Xaa at position 290 is Arg,
Xaa at position 292 is Val,
Xaa at position 293 is Ala,
Xaa at position 294 is Glu,
Xaa at position 296 is Lys,
Xaa at position 298 is Gly,
Xaa at position 306 is Gly,
Xaa at position 310 is Arg,
Xaa at position 311 is Ala,
Xaa at position 317 is His, and
Xaa at position 340 is Thr.

Claim 12 (previously added) An isolated nucleic acid fragment that is a full complement of the isolated nucleic acid fragment of Claim 6.